**Phase Unwrapping for Large InSAR Data Sets Through Statistical Cost Tiling**

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## Abstract:

Two-dimensional phase unwrapping is a key step in the analysis of InSAR data, and many algorithms for this task have been proposed in recent years. Some of these algorithms have shown promise in handling the problem's intrinsic difficulties, but new difficulties arise when the dimensions of the interferometric input data exceed the limits imposed by computer memory constraints. Similarly, new phase unwrapping strategies may be required when sheer data volumes necessitate greater computational throughput. These issues are especially important in the context of large-scale topographic mapping projects such as SRTM and the Alaska DEM Project. We propose a technique for applying the statistical-cost, network-flow phase unwrapping algorithm (SNAPHU) of Chen and Zebker (2001) to large data sets. That is, we introduce a methodology whereby a large interferogram is unwrapped as a set of several smaller tiles. The tiles are unwrapped individually and further divided into independent, irregularly shaped reliable regions. The phase offsets of these reliable regions are then computed in a secondary optimization problem that seeks to maximize the probability of the full unwrapped solution, using the same statistical models as employed in the primary phase unwrapping stage. The technique therefore approximates a maximum *a posteriori* probability (MAP) unwrapped solution over the full-sized interferogram. The secondary optimization problem is solved through the use of a nonlinear network-flow solver. We examine the performance of this technique on real interferometric data sets.